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ABSTRACT

This study used a reflective framework in a teacher education course to guide students in a process of deep-level reflection for analyzing the relationship between the instructor's teaching and their learning. The students reflected on their own experiences as students in university classes to analyze the dynamic interactions between teaching and learning. A group of 75 preservice teachers used the framework over 10 weeks. The framework involved three phases: analysis, synthesis, and theorizing about teaching and learning. The phases supported the students in analyzing the relationship between teaching and learning. Various teaching strategies provided students with a range of teaching experiences to consider in light of their own learning and for analysis according to the proposed three-phase framework. Students reflected on their class experiences after each laboratory class, documenting how they learned by using the reflective framework. They collated personal and social factors that influenced their learning into a personal learning profile and theorized about the factors and how they related to each other. At the end of 10 weeks, students used their reflections to generate a personal model of teaching and learning. Results showed that all students could identify influential factors and collate them into personal learning profiles. The framework supported all 75 preservice teachers in analyzing teaching and learning, though they theorized about the relationship to varying extents. (Contains 17 references.) (SM)

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Reciprocating self-study: A reflective framework for conceptualising teaching-learning relationships

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Abstract—In this study 75 preservice teachers used a framework to reflect upon their experiences of teaching and learning over a 10 week teacher education course. There were three phases in the framework—analysis, synthesis and theorising—which supported the students in analysing the relationship between my teaching and their own learning. At the end of the subject the students used their reflections as the basis for generating a personal model of teaching and learning. The study shows that the framework supported all 75 preservice teachers in analysing teaching and learning but they theorised about the relationship to varying extents.

INTRODUCTION

A systems model of teaching and learning

Teaching and learning is a complex relationship because it involves the mutual interaction of many factors—personal, social, cultural and political. In support, Biggs (1993) compared higher education to a systems model with any course being like a dynamic ecosystem containing several "nested micro-systems" (p. 77) which all interact: the student system, the teaching context, the institution system, and the community. Because of the interrelatedness of these micro-systems, he concluded that efforts for professional learning in teacher education should study these systems in conjunction, "a fruitful understanding of teaching and learning requires that

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when any aspect of the learning/teaching context is the focus of attention, the micro-system of which that is a part, and the adjacent systems with which it may interact, need to be taken into account" (1993, p. 83).

One of the main goals of teacher education, therefore, should be that preservice students graduate with a deep understanding of the relationship between the processes of teaching and learning and how they interact (Darling-Hammond, 1995). This argument is not new. In 1901, Dewey wrote that "the process of learning and that of teaching go together, just as do buying and selling. No one can buy unless someone else is sells, and no one can teach unless someone else is learning" (p. 5). The implication is that instructional approaches promoted in teacher education courses should be based not only on a teacher's understanding of subject matter, but also on an understanding of students and how they learn. However, many teacher education courses do not focus on trainee teachers developing a deep understanding of student learning and this facet in the USA has been called "the most neglected aspect of teacher preparation in this country" (Darling-Hammond, 1995, p. 13).

Studies in Australia have also shown that many university students do not have deep understanding of learning (Ramsden, 1988). Boulton-Lewis (1994) asked 1249 students and their 21 lecturers (across 12 faculties in the Queensland University of Technology) to write a page to describe their beliefs about learning. She used the SOLO (Structure of the Observed Learning Outcome) taxonomy proposed by Biggs & Collis (1982) which categorises the depth of understanding of knowledge to analyse the statements. She found that the majority of responses for both students and staff were "multistructural" meaning that several independent aspects of learning were

presented (such as learning by doing, rehearsal, or interest) but were not integrated into an overall structure which shows how they were related. The conclusion was that most lecturers and students did not have a deep enough understanding of learning in order to be a strong influence on their teaching. In particular, most students had a quantitative conception of learning as an increase in knowledge rather than a qualitative conception of learning resulting in a new way of understanding the world (Marton, Dall'Alba & Beaty, 1993). These results were supported by a follow up study of 40 practicing teachers in an inservice course concerned with adult learning (Boulton-Lewis, Wilss, & Mutch, 1996). The teachers were also asked to write a page to describe their beliefs about learning. Also using the SOLO taxonomy, the study found that 32 (80%) of the practicing teachers had a "multistructural" understanding of learning and only 5 (12%) had a "relational" understanding meaning that they could integrate relevant aspects of learning into an overall structure. However, none of the teachers could describe learning at the highest level, "extended abstract", by generalising their understanding into a new domain. This was disappointing considering that one of the main roles of a teacher is to organise their teaching to maximise opportunities for student learning.

What is the basis of this problem which inhibits preservice students and teachers in developing a deep understanding of learning and its relationship to teaching? There are, I believe, two possible reasons. First, teaching and learning are often treated as separate entities in teacher education courses with different subjects focusing on different micro-systems of the educational ecosystem. For example pedagogical approaches are covered in subjects such as Principles of Teaching (which include models of teaching and how to design lesson plans) in isolation from learning which

is often covered in subjects concerned with Educational Psychology. This separation of complex connected processes is a common occurrence in teacher education with the expectation that students should make their own connections between subjects which are often taught in isolation to each other and even months or a year apart. Instead, theory should be presented in a broader context so that the "relational perspective" with other interacting components (Ramsden, 1987) is made clear. The second reason is that many teacher education courses present content using a top down approach which attempts to deliver educational theories and ideas about good teaching practice to students. Often this involves students passively studying decontextualised knowledge from educational textbooks and using surface level approaches (Biggs, 1993) to learning which have little relevance to their personal experiences. Rarely do courses take a constructivist perspective and support students in generating their own knowledge about teaching and learning.

How then can preservice teachers gain a deep understanding of learning and relate this to their views about teaching? A valuable opportunity exists at university for preservice students to learn about an authentic relationship between teaching and learning—by studying their own personal experiences as students in light of stragegies used by lecturers in their teacher education subjects. Biggs (1993) argued that every tertiary classroom is a "swamp" with ongoing interactions between the lecturer and students in a classroom context. Trainee teachers can use a constructivist perspective and generate their own knowledge about the relationship between the teaching they are experiencing as students and their own learning. Furthermore, this places an emphasis on their own "authority of experience" (Munby & Russell, 1994)

by analysing and making meaning of the learning context in their own teacher education classes.

Frameworks for reflecting on experiences

In order to make meaning of their personal experiences, a framework is often useful to guide students in ways to be reflective practitioners (Schon, 1983, 1987). Dewey first highlighted the value of reflection on personal experiences in How We Think (1933) describing it as a particular form of inquiry into one's thoughts and actions which have some form of puzzlement to resolve. He argued:

> The function of reflective thought is, therefore, to transform a situation in which there is experienced obscurity, doubt, conflict, disturbance of some sort, into a situation that is clear, coherent, settled, harmonious. (Dewey, 1933, pp. 100-101)

He proposed five phases to assist reflection on action: suggestions, problem, hypothesis, reasoning and testing. These phases link in an iterative manner with each of the phases triggering other phases but not necessarily in any particular order or frequency (Loughran, 1996).

Other frameworks for reflection on experiences have been proposed specifically for adult learners. Feldman (1967) proposed a reflective framework for analysing art experiences based on four stages: description; analysis; interpretation; and judgement. Mezirow (1977) also described a framework called a transformational learning cycle which contained four main stages: experience, critical reflection/evaluation, and

reframing. Kolb (1984) also included reflection as one of the components in his cycle of experiential learning: experience, reflection, generalisation and testing. More recently, Peters (1992) proposed another framework (DATA) to guide adults in being reflective practitioners by identifying the assumptions which underpin their practice and to seek alternatives. The first step, description, involves identifying the task or problem that needs attention which may be achieved using a critical incident technique or personal interview. The second step, analysis, involves the problem solver identifying the reasons, beliefs, or assumptions for actions taken by methods such as keeping a personal journal, writing an autobiography or using a repertory grid. The third step, theorise, means to devise alternative ways to improve one's practice and the fourth step, act, means implementing the action and using this step as the basis for further reflection and analysis.

These frameworks, however, all identify stages for thinking which relate to general problem-solving processes but do not provide pointers for what to examine in the actual reflective process. What commonly inhibits the problem-solving process is that many people do not know what to look for in order to be reflective practitioners and find it difficult to conceptualise beyond the frames which constrain how they already think. In short, they are prisoners of their own beliefs and often specific guidelines or pointers are needed to assist people to reflect upon their experiences especially when analysing complex interactions such as between teaching and learning.

A reflective framework for conceptualising teaching-learning relationships

The purpose of this paper is to explain how a reflective framework was used in a teacher education course to guide students in a process of deep level reflection to analyse the relationship between my teaching and their learning which they had experienced. In effect students reflect on their own experiences as students in university classes to analyse the dynamic interactions between teaching and learning. This process gives directions for preservice teachers to engage in deep level reflection which is a form of metacognition and uses deep approaches to learning (Biggs, 1993). Furthermore, as students document influences on their learning, they are also providing the instructor with ongoing feedback on his/her teaching. So the process is reciprocal—the instructor studies teaching by encouraging students to study their own learning and how this is influenced by the instruction which they are experiencing.

There are three phases in the reflective framework. The first stage occurs for the duration of the course (usually 10 weeks) and the second and third stage are implemented towards the end of the course although they can be undertaken concurrently:

Phase 1. Analysing Teaching and Learning

The basis of the reflective framework for the context of a university classroom setting are the main factors included in a social constructivist perspective on learning (Prawat & Floden, 1994). This theoretical perspective provides pointers which guide students in being reflective about four interacting components of social constructivism: the student, the teacher, other students and the situation. After every

class, students use a journal to reflect on their experiences to identify personal (the student), social (the teacher and other students) and situational influences on learning according to the following pointers:

(i) you (student) such as prior knowledge, attitude, motivation;

(ii) me (teacher) such as organisation, concern about students, clear goals, teaching strategies;

(iii) other students such as their enthusiasm and sharing ideas

(iv) situation such as the type of activity and comfortable environment.

This is carried out every week and is like using a four-way lens to analyse classroom experiences.

Phase 2. Synthesising Teaching and Learning

Towards the end of the subject students collate all the factors which influenced their learning according to the four pointers and present them in a table called a personal learning profile. These are cross-referenced to each week of the journal to identify the class upon which the reflections are based.

Phase 3. Theorising Teaching and Learning

At the end of the subject the students reflect on their personal learning profile (a type of meta-reflection) and theorise about the relationships between teaching and learning. This is represented in two ways. First, the students sketch a diagram showing relationships which is like a model of teaching and learning. Furthermore, the students provide a written explanation of how the processes of teaching and learning interact in their diagram.

METHOD

This study reports on the results of 75 teacher education students in a Bachelor of Teaching (Early Childhood) course who used a reflective framework in a science methods subject to analyse teaching and learning. The purpose of the course was to inform preservice students about various teaching approaches for teaching science and to support students in developing their own understanding about the connections between teaching and learning. In this course the students had a one hour lecture and a two hour hands-on practical (laboratory) class each week. The one hour lecture presented aspects of science content and the two hour practical class provided opportunities for the students to experiment with hands-on activities concerned with the particular science topic addressed in the lecture. Various teaching strategies were used throughout the course to provide students with a range of teaching experiences to consider in light of their own learning and for analysis according to the proposed three phase reflective framework.

First, after each laboratory class the students were asked to reflect on their class experiences by documenting what they learned and how they learned. The students documented how they learned by using the reflective framework to first analyse factors which influenced their learning. This included personal factors (themselves as learners) and social factors (myself as their instructor and other students) according to four pointers: you (student), me (instructor), other students and the situation. The students did this on a weekly basis being aware that they had to be specific about the factors so that they could collate them in the next phase of the framework. Second, towards the end of the course the students synthesised the factors by collating them into a table called a personal learning profile which summarises all the factors which

influenced their learning. Finally, the students were asked to consider all of these factors about teaching and learning and to theorise about them to consider what are the main factors and how they relate to each other. As part of this third phase students were asked to sketch a diagram representing a personal model of teaching and learning as well as explaining how these factors relate to each other.

The depth of understanding of teaching and learning displayed in the students' personal model of teaching and learning was judged according to the Structure of the Observed Learning Outcomes (SOLO) taxonomy which is a five level system used to assess a learner's performance (Biggs & Collis, 1982). This taxonomy provides a systematic way of describing how a learner's knowledge grows in complexity when mastering academic tasks and has been used to assess the quality of learning in higher education (Biggs, 1996; Boulton-Lewis, 1994). The first two levels levels indicate a quantitative accrual of the components of the task and the next three levels indicate an increasingly qualitative understanding of the task. Biggs (1996) used the SOLO taxonomy to establish a hierarchical list of "performances of understanding" for preservice teacher education students to monitor their understanding of teaching and learning in a psychology subject. These descriptors for the levels devised by Biggs (1996) have been modified slightly to consider factors for teaching and learning for use in this study:

Level 1: Prestructural (fundamental misunderstanding about teaching and learning)

Level 2: Unistructural (a few factors about teaching and learning are known representing nominal understanding)

Level 3: Multistructural (many factors about teaching and learning are understood but are treated independently)

Level 4: Relational (many factors about teaching and learning are connected showing an appreciation of how one influences the other)

Level 5: Extended abstract (many factors about teaching and learning are integrated into a coherent whole showing metacognitive understanding and reconceptualised to a higher level of abstraction such as formulating a personal model of teaching and learning)

These levels are suitable to determine the quality of the outcomes when university students are engaged in the reflective framework of analysing teaching-learning interactions.

RESULTS

When students use the reflective framework there is potential for learning by both the students and lecturer involved. In this respect, the learning from the reflective framework is reciprocal—students analyse teaching and learning and at the same time provide feedback for the professional development of their instructors. The results section will be divided into a section for student learning and a section for teacher learning.

Learning for preservice teacher education students

These will be presented in terms of the three phases in the reflective framework:

Phase 1. Analysing Teaching-Learning

Each week the students documented the positive and negative factors which influenced their learning in a portfolio according to the four pointers as guides for their thinking—you (the learner), me (the instructor), other students and the situation.

Phase 2. Synthesising Teaching-Learning

Towards the end of the subject students collated all the factors which influenced their learning according to the four pointers which are presented in a table called a personal learning profile. These are cross-referenced to each week to document the class upon which the reflections are based. It should be noted that the students only documented teaching and learning for the first six weeks as the subject was divided into two by a five week practicum. This collation shows the positive and negative factors which influenced teaching and learning during the course. An example of a personal learning profile from one student is shown in Table 1 which also includes numbers after each factor which refer to the week of the specific class involved.

Table 1. A personal learning profile generated from phase 2 (synthesising teaching and learning) of the reflective framework

Pointers	Positive/enhancing factors	Negative/inhibiting factors
Me—Personal factors	• positive attitude (1, 3, 5) • interest in the topic (1, 4, 5, 6) • hands on experiences (1, 2, 5) • time to inquire (1, 2) • visual stimulation (1, 2, 3) • rewriting the experiment (2) • medication, yoga (3, 5)	• negative past experience (2, 3) • disappointment in self (2) • introduction to activities (2) • more instruction (2) • no alternate ways (4) • preoccupied with matters (6) • tired (6)
You—the teacher	• demonstrated enthusiasm (1, 2, 5) • showed positive attitude to and values to science (1) • positive approach to students ie their questions and concerns (1, 2, 3, 4, 5) • creating a warm environment (3) • easy to approach (1)	• more questions (2) • not aware of class needs (2) • did not share personal experiences (5) • not available in classroom (5) • unorganised (2, 4) • confused instructions (5)
Other students	• small group work (1, 4, 6) • stimulate ideas (1, 3) • encouragement (1) • sharing personal experiences (1, 2, 3, 6)	• not many ideas (2) • others not understanding (2) • group too large (3) • negative atmosphere created by others (5)
Setting	• comfortable environment (2) • plenty of materials (3)	• equipment not working (2) • not enough room (2)

All students were able to collate their written reflections from phase 1 and construct a personal learning profile. For the next phase students were asked to consider these factors to conceptualise an understanding of the relationship between teaching and learning.

Phase 3. Theorising Teaching-Learning

The final phase of the reflective framework is for students to generate a personal model of teaching and learning based on the ongoing analysis of teaching and learning which they were experiencing in their science methods class. The 75 students were able to do this to varying extents and the depth of understanding of the teaching-learning relationship was assessed according to the SOLO Taxonomy (Biggs & Collis, 1982) as shown in Table 2.

Table 2. Summary of responses from phase 3 (theorising teaching and learning) according to the SOLO Taxonomy

SOLO Levels	Description	Number (%)
Prestructural	Fundamental misunderstanding about teaching and learning.	0
Unistructural	A few factor about teaching and learning are known representing nominal understanding	0
Multistructural	Many factors about teaching and learning are understood but are treated independently.	40 (53%)
Relational	Many factors about teaching and learning are integrated into a coherent whole showing an appreciation of how factors relate to each other.	31 (42%)
Extended abstract	Many factors about teaching and learning are integrated into a coherent whole showing metacognitive understanding and reconceptualised to a higher level of abstraction such as formulating a personal model of teaching and learning	4 (5%)

Table 2 shows that all students were able to conceptualise a relationship between teaching and learning but to varying extents. Fifty three per cent of students were at the multistructural level showing that there were several factors which influenced teaching and learning but that these did not relate to each other. Forty two per cent of students were able to show that teaching and learning were connected (relational) and 5% were able to extend their thinking into a higher level of abstraction devising a personal model of teaching and learning.

The four students who conceptualised a model of teaching and learning to the extended abstract level were particularly interesting and parts of their written explanations are summarised below:

Student 1: Theorising teaching and learning as an Expository-Exploratory Model

This student represented the teaching-learning relationship as a rocket launcher (teaching) which projected a rocket (student) into space (see Appendix 1 for diagram). This is how he described his model:

> My personal model of teaching and learning can be best described by using the launch of a rocket into space as an analogy. Holding the rocket to the earth is gravity which I describe as no prior knowledge. Past the earth's gravitational pull, out in space there are vast amounts of knowledge, interest and motivation. To launch the rocket from earth through gravity and no knowledge into space where there is knowledge, interest and motivation requires high levels of energy. This energy comes in the form of expository teaching. The power of expository teaching blasts the learner into an orbit of

opportunity created by the momentum of prior knowledge—the expository lesson. Once in orbit the learner explores the concepts, builds on knowledge, experiments and learns. Near the end of the orbit there is a chance to review the mission and get feedback from ground control about the lesson. When the mission is complete the learner returns to earth with enthusiasm for the next journey.

Student 2: Theorising teaching and learning as a game of softball

This student represented the teaching-learning relationship as a game of softball with a progression of four bases showing significant periods in the process of developing ideas (see Appendix 2 for diagram) "Learning is like a game . . . . the game I have chosen is softball as I felt the four bases contribute to a significant period in the learning process. How fast you move around the bases depends on factors that enhance or impede learning".

She summarised her model into five stages:

(i) introduction into the game is needed to ignite the interest, motivation, the challenge and determination to learn. Factors that inhibit the learning of the game are the attitude of not wanting to play, preoccupied, tiredness, and most importantly not receiving a positive introduction of support of the game.

(ii) development and application of the ideas

(iii) ideas need to be organised

(iv) ideas need to be concrete with plenty of time and space to explore ideas in different ways.

(v) putting all the information together means expressing what has been found out and relating it to the overall picture.

When discussing implications for teaching the student wrote:

> This subject has provided me with many great ideas and an awareness of creating an environment for the best kind of learning. The learning porfolio has enabled me to look at how I learn, what helps and what hinders my learning. Therefore when I teach children I should have an idea of the factors that will best initiate their learning and put them into practice i.e. what I can do as a teacher, how I group the children and the resources and environment that I have or can create for them.

Student 3: Theorising teaching and learning as a growing bubble

This student represented the teaching- learning relationship as a growing bubble :

> The bubble begins with a healthy mind feeling well and full of knowledge as a drop of motivating introduction enters the bubble it grows again and makes me feel motivated. Then by finding out my prior knowledge on the subject the bubble grew again as I was able to apply some knowledge to the subject. The opportunity to share ideas then enters the bubble and it grows again as I am feeling challenged. Through clear instructions and being exposed to new information being added to the bubble, it grows and I feel as though I can participate in hands-on activities. As time is added to the bubble it grows again as I am feeling free to explore. When a clear explanation is offered the bubble

grows as I feel satisfied with what has been learned. Through being satisfied the ability to apply this to another situation is added and then the whole process can begin again with a new situation.

Student 4: Theorising teaching and learning as a growing plant

This student represented the teaching-learning relationship as growing plant from seed. The cycle starts off as a dormant seed (student with prior knowledge) and the seed is germinated by direct learning from lectures (teaching) which is like the seed being planted in soil. Interest and curiosity are like water and sunshine to assist germination which is then followed by hands on experimentation which is like fertiliser to provide rapid growing. The following implications for teaching were written:

(i) establish the students' prior knowledge

(ii) teach in creative ways to build curiosity, interest & motivation

(iii) allow for lots of hands on experimentation, trial and error, problem solving

(iv) be aware of physical well being and hour of the day when teaching

(v) explanations should be clear and instructions easily understood

(vi) group work builds confidence and peer tutoring

(vii) varied activities promotes lifelong enthusiasm for learning.

My own learning about teaching in the science methods class

By observing the preservice teachers' personal learning profiles and models of teaching and learning, I learned a great deal about aspects of teaching and well as a

major lesson about the nature of teaching. From a technical perspective I learned the following aspects about teaching in my science methods class:

- practice what I preach in terms of modelling different ways to teach science
- students like to have a connection make between lectures and tutorial experiences
- students like me to know them a person and to find out about their interests
- students like a clear introduction at the beginning of a lecture and the practical class
- have clear, typed overheads for lectures
- at the beginning of a lecture state the connections of the content with previous lectures
- refer to my own teaching experiences in lectures
- discuss how to apply theory in practice situations
- organise relevant activities for tutorials that link with lectures
- take into account workload in other subjects
- use humor to build a relationship with the students in a class

However, there is a larger lesson which I learned about the problematic nature of teaching. From observing the students' products of teaching and learning I realised that students can have different interpretations on common experiences in their science methods class. For example, in one lesson I used a didactic approach and guided students step by step in a tutorial about constructing simple toys based on a different center of gravity. This was interpreted in different ways by students. Some liked the step by step instructions whereas others did not like it and preferred something more open ended. In contrast, in another tutorial on designing boats which was taught in an open ended approach providing students with time to explore their own ideas was also interpreted in different ways. Some students,

mostly those with some prior knowledge about boat design, preferred the more open type of lesson whereas other students (usually those with little prior knowledge about boat design) preferred to be directed throughout the activity. In short, it became apparent to me that there was no one type of instruction which all students preferred and this experience has helped me to understand the problematic nature of teaching. The implication is that I should treat teaching as an "adventure to support student learning" realising that there is no "holy grail" or one perfect way of implementing a lesson because of the range of students in any one class with varying personal, social and cultural backgrounds. Instead I should vary my teaching approaches as much as possible attempting to seek feedback on my efforts to monitor the fluid relationships between teaching and learning.

DISCUSSION

Using the proposed reflective framework, all 75 students were able to identify factors which influenced teaching and learning as well as collating them in a personal learning profile produced during phase 2. In addition, at the end of the subject all the students sketched a diagram showing factors related to teaching and learning as required by phase 3, but the relationship was conceptualised to different extents. Using the SOLO taxonomy to assess their diagrams, over half of the students (53%) had a multistructural understanding of teaching and learning (several factors operating independently) whereas a smaller number (42%) of students were at the relational level and only a few (5%) were at the extended abstract level.

What is important is that nearly half of the students (47%) were able to represent a relationship between teaching and learning with factors that influence each other

(relational at 42% plus extended abstract at 5%). Furthermore, these students described how these factors interrelated in their written explanations. In particular, the personal models of teaching and learning at the extended abstract level produced by four students showed growth in understanding with continued interactions between teaching and learning.

The number of personal models constructed by the preservice teachers at the relational (42%) and extended abstract levels (5%) in comparison with the literature was substantial. The study by Boulton-Lewis, Wilss and Mutch (1996) showed that none of the 40 practicing teachers could describe learning at an extended abstract level and only 12% had an understanding at a relational level. This means that only a few of the teachers could identify and describe a relationship between several factors that influenced learning and the conclusion was the teachers' understanding about learning was a poor basis for their instruction. A recommendation was that researched teaching interventions are necessary to assist students to change their beliefs about learning but they did not mention how this deeper understanding has implications for teaching. Accordingly, getting 46% of the preservice students to identify different factors about teaching and learning and to describe a relationship between them is substantial.

The proposed reflective framework in this study is similar to the one proposed for adult learners by Peters' DATA framework (1991)—description, analysis, theorise and act— except for two major differences. First, the proposed reflective framework has specific pointers to guide trainee teachers in what to reflect upon in the analysis phase. These four pointers—you (student), me (teacher), other students and the

situation, provide students with specific signposts to assist them in analysing their experiences of teaching and learning. These pointers then have a strong influence in framing what students reflect upon and what they construct in the form of their personal learning profiles and a personal model of teaching and learning. Secondly, the proposed reflective framework does not have a fourth phase which is a limitation. Including a fourth phase of putting personal models into action, possibly in a practicum component, would be useful to ascertain if the reflective framework had an impact on practice in a school classroom. This final stage would be an indicator as to whether the reflective framework does generate higher levels of a qualitative conception of learning being a change in understanding of a concept and as a person (Marton et al, 1993).

The proposed reflective framework does have another benefit as well as encouraging students to study an authentic relationship between teaching and learning—as a tool for providing me with ongoing feedback for my own professional development. This is the reciprocative side of the reflective framework. From examining the students' personal learning profiles, it was clear to me that teaching and learning is not the same relationship for all students. It was interesting that as I varied my teaching approaches, some students learned more from certain approaches than others. For instance in the week that I used more expository methods, this suited some students more than others. Similarly, in the week that I encouraged students to use more self investigative techniques, this again suited some students more than others. This made me realise how important it is to vary my teaching approaches to accommodate different ways of learning and degrees of prior knowledge about a particular concept. In addition, as I have been monitoring students' personal

learning profiles I have become more aware of the problematic nature of teaching. This is something that I knew about but I am gaining a deeper understanding of it as I continue to monitor how my teaching influences my students' learning.

CONCLUSION

The main conclusion from this study is that the proposed reflective framework is useful for supporting students in developing an understanding of the dynamic relationship between teaching and learning. In particular, it appears that the students can use their own university classes as a context to learn by experience about teaching and learning. Although not all students in the course were able to conceptualise teaching and learning at the relational or extended abstract level, the framework supported 47% of students in gaining a deeper understanding of the interactions between teaching and learning. Perhaps some students needed more time to consider the analysis of their experiences or to exchange ideas with other students to help them conceptualise their reflections. Importantly, however, students had begun to reflect upon teaching and learning as a relationship, not as separate entities as it is often presented in teacher education courses.

This is one way to engage preservice students in deep approaches to learning by reflecting upon and analysing their own experiences as university students (Biggs & Moore, 1993). In addition, it may be useful if students began to study teaching and learning experiences across different subjects. Many students stated that they had begun to analyse teaching and learning in other subjects using the same framework although it was not a designated part of the course. In this way their different teacher education classes could become varying contexts for studying and analysing the

similarities and differences between teaching approaches and learning. This would give students the opportunity to further develop their personal theory of teaching and learning and highlight their "authority of experience" (Munby & Russell, 1994) for the length of their teacher training. This of course assumes that instructors are willing to allow students to critique their teaching on a regular basis. This is a limitation of this framework as lecturers need to encourage students to identify the positive and negative aspects of their instruction which some lecturers may find too threatening.

Using educational theory as the basis for forming particular frameworks to analyse experiences introduces an innovative way to use theory in teacher education courses. Instead of simply telling students about a particular theory, they can use it as a lens to analyse experiences and build their own personal theories about the particular aspect. Although it was not part of their course, students could use their newly generated personal theories to compare and contrast their ideas with established educational theory. For instance students could use views about particular learning styles as a lens to analyse experiences about this particular educational aspect and then use their insights to confirm or disconfirm the particular theory for them. This brings theory to life for the students and supports them in becoming informed about a particular theory in order to critique it for their own contexts.

One difficulty, however, in using the proposed reflective framework which became evident in the first few weeks of the course is that it was conceptually difficult for preservice students as they had not conducted this type of personal reflection before and were unsure about what to look for and how to do it. For this reason several

reflection before and were unsure about what to look for and how to do it. For this reason several examples of each phase produced by previous students were shown to guide students in what to look for in analysing teaching and learning. Furthermore, this had to be revisited several times in the first few weeks with discussions about what the students were documenting. Perhaps this reflective process could become more transparent for the students if I made explicit my understandings of teaching and learning by "thinking aloud" as recommended by Loughran (1996). Finally, one hopes that the reflective framework proposed in this paper will support students in better understanding Schon's metaphor of education as a "swamp" so they that not only study the anatomy of the alligators, but also the interrelated micro-systems which enable them to survive and flourish.

Notes

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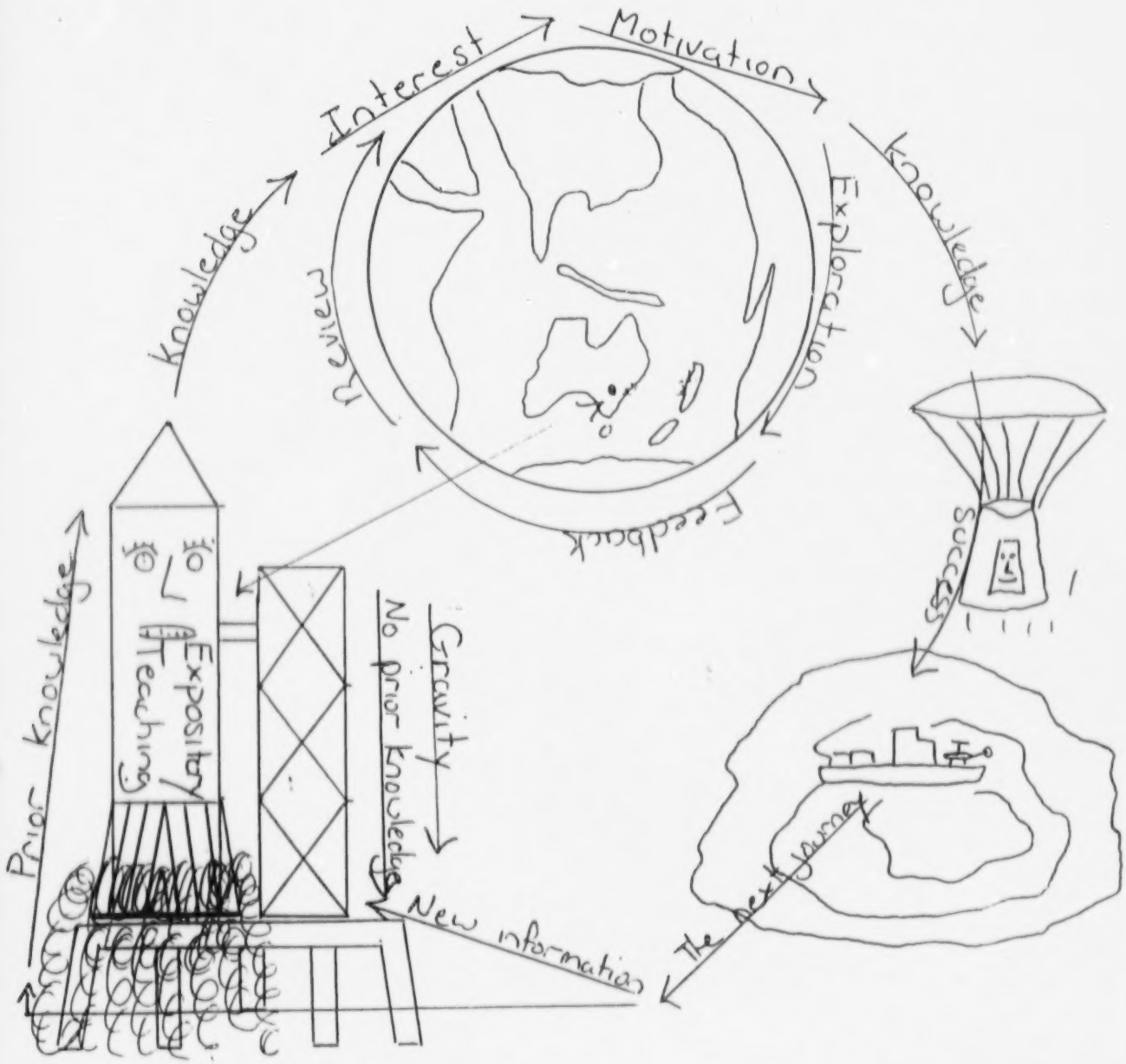
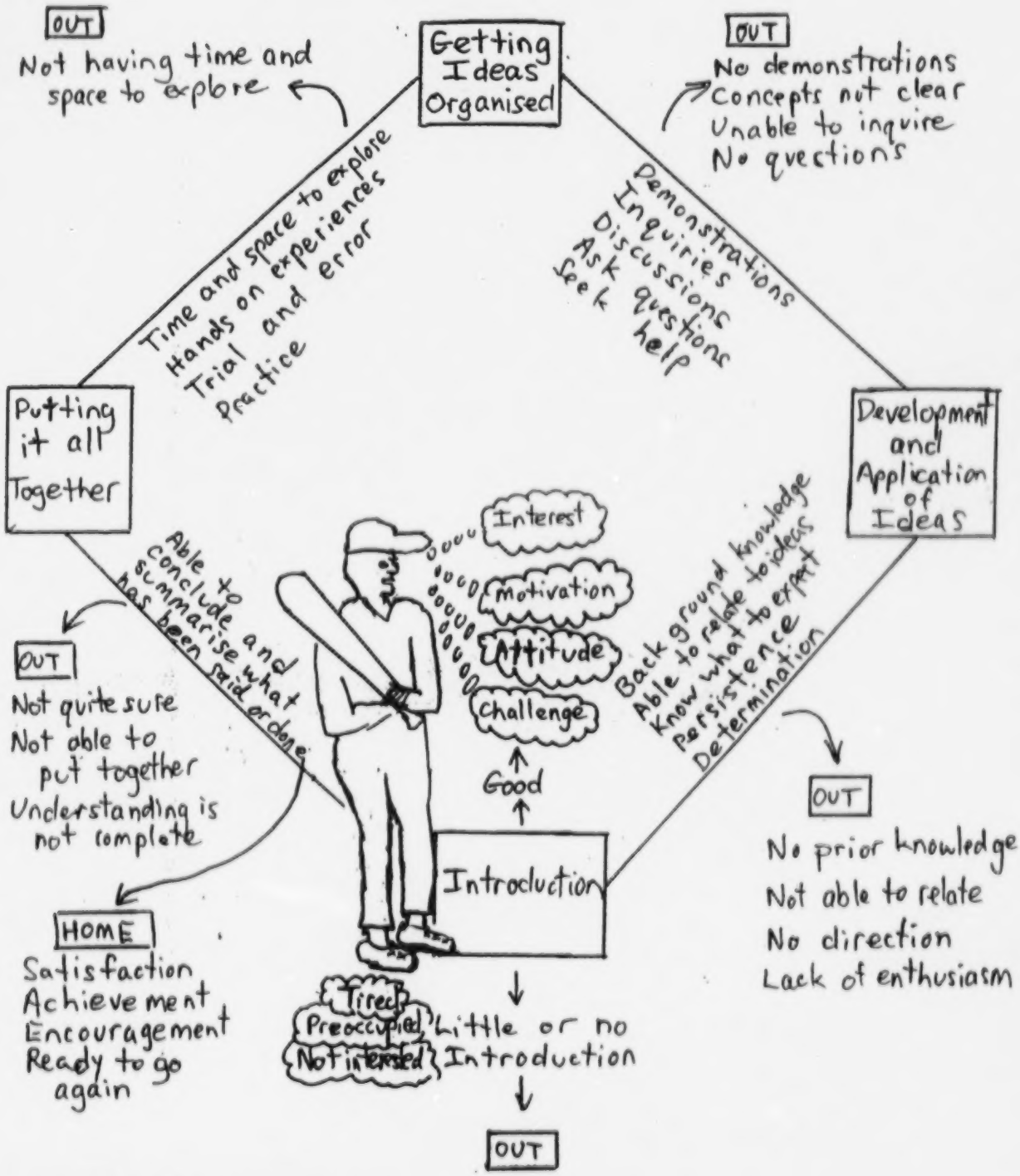
APPENDIX 1

THE EXPOSITORY-EXPLORATORY MODEL



The Teaching-Learning Game



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